

Cropland conversion and sage-grouse lek persistence

Estimating impacts and planning for the future

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Outline

- Cropland in sage-grouse Management Zone I
- Why worry about cropland conversion?
 - Policy and recent patterns in cropland conversion
- Impacts of cropland on sage-grouse
 - Scale and thresholds
- What can we do about it?
 - Mapping risk to prioritize conservation implementation

Cropland in sage-grouse Management Zone I

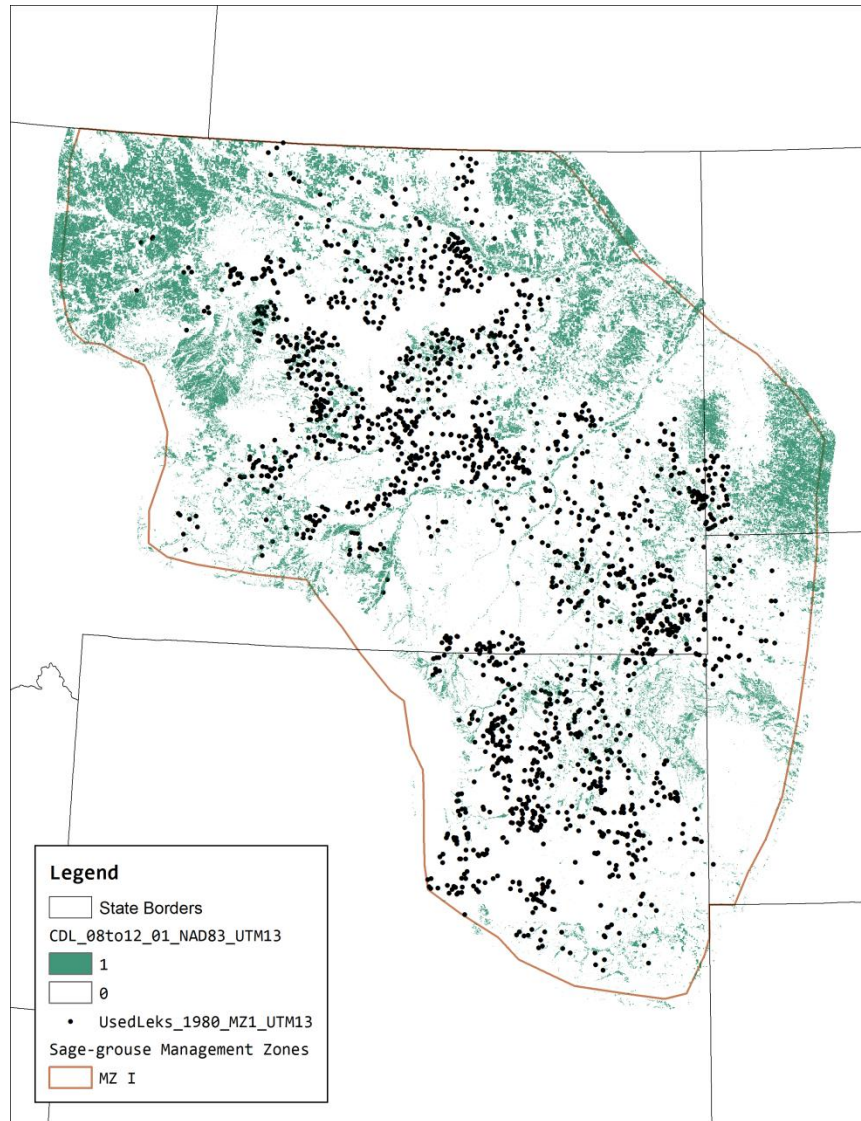
- Majority of sage-grouse habitat is privately owned

Zone	BLM	Other public	Private
MZ1	17%	17%	66%
Total	51%	18%	31%

- Cropland already major component of landscape

Zone	Cropland	6.9 km effect zone
MZ1	18.7%	90.7%
Total	11.2%	77%

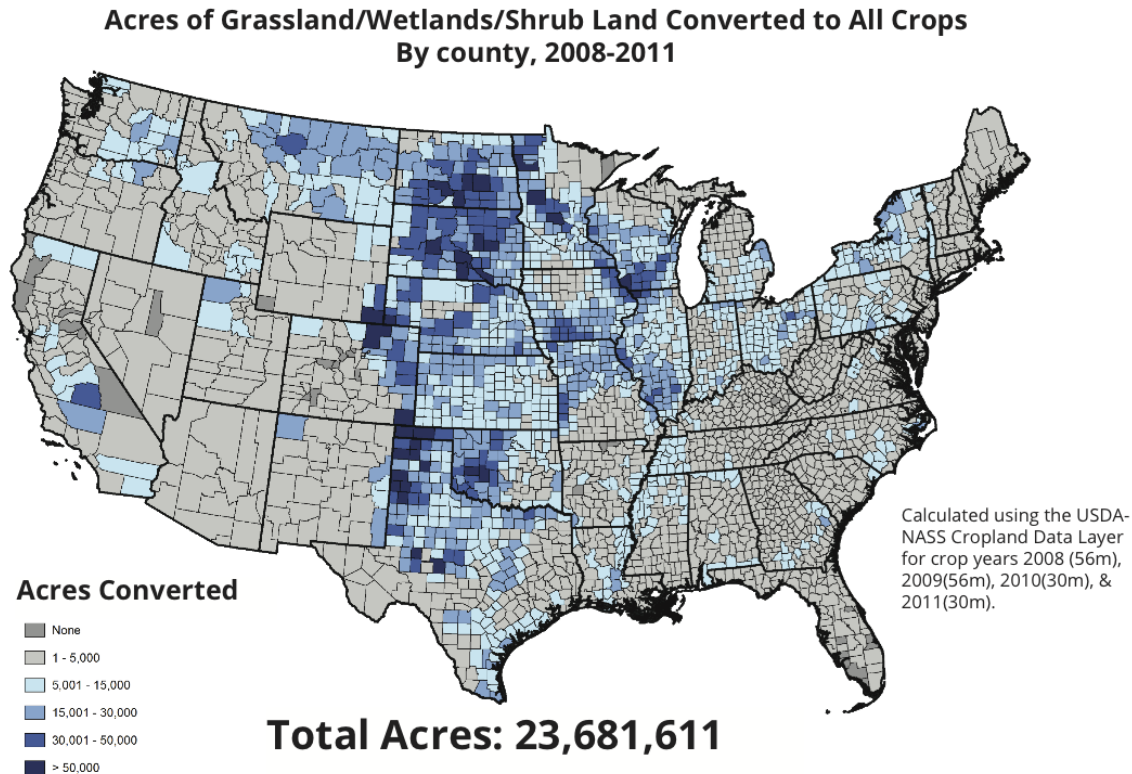
Cropland in sage-grouse Management Zone I



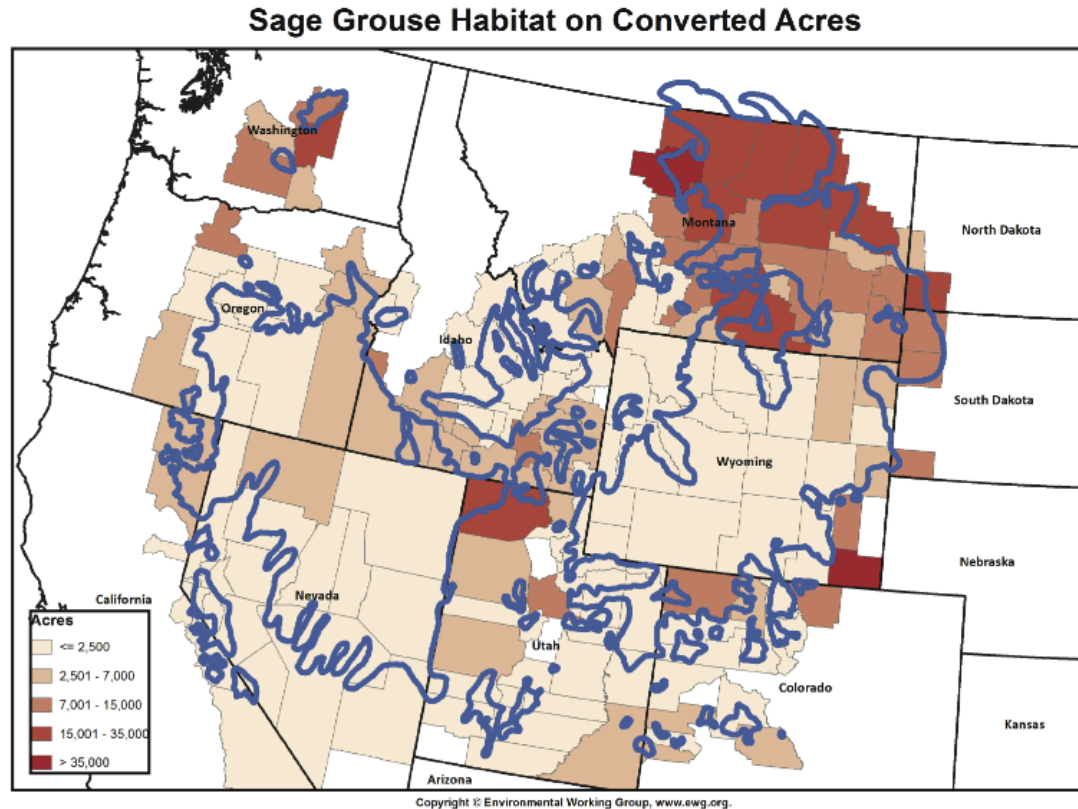
Why worry about cropland conversion?

- Federal Policy
 - 2005: **Energy Policy Act**
 - mandated 4 billion gallons of ethanol incorporated into gasoline sold in US by 2006
 - 2007: **Energy Independence and Security Act**
 - mandates 15.2 billion gallons by 2012, 36 billion gallons by 2022
 - mandates for cellulosic and 'next generation' biofuels

Why worry about cropland conversion?



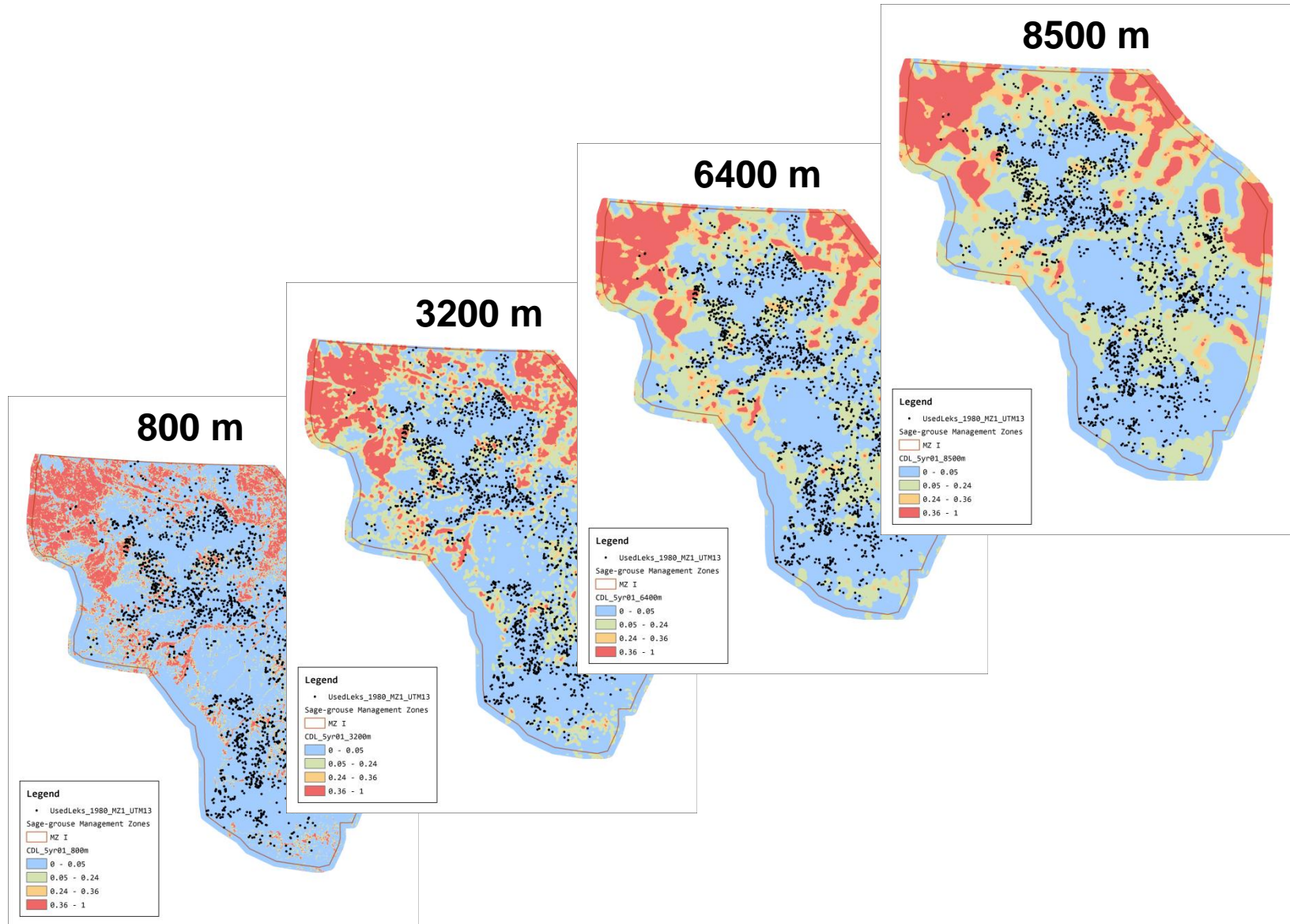
Why worry about cropland conversion?



Impacts of cropland on sage-grouse

- Questions:
 - What is the scale of the effect?
 - What are thresholds for lek persistence?

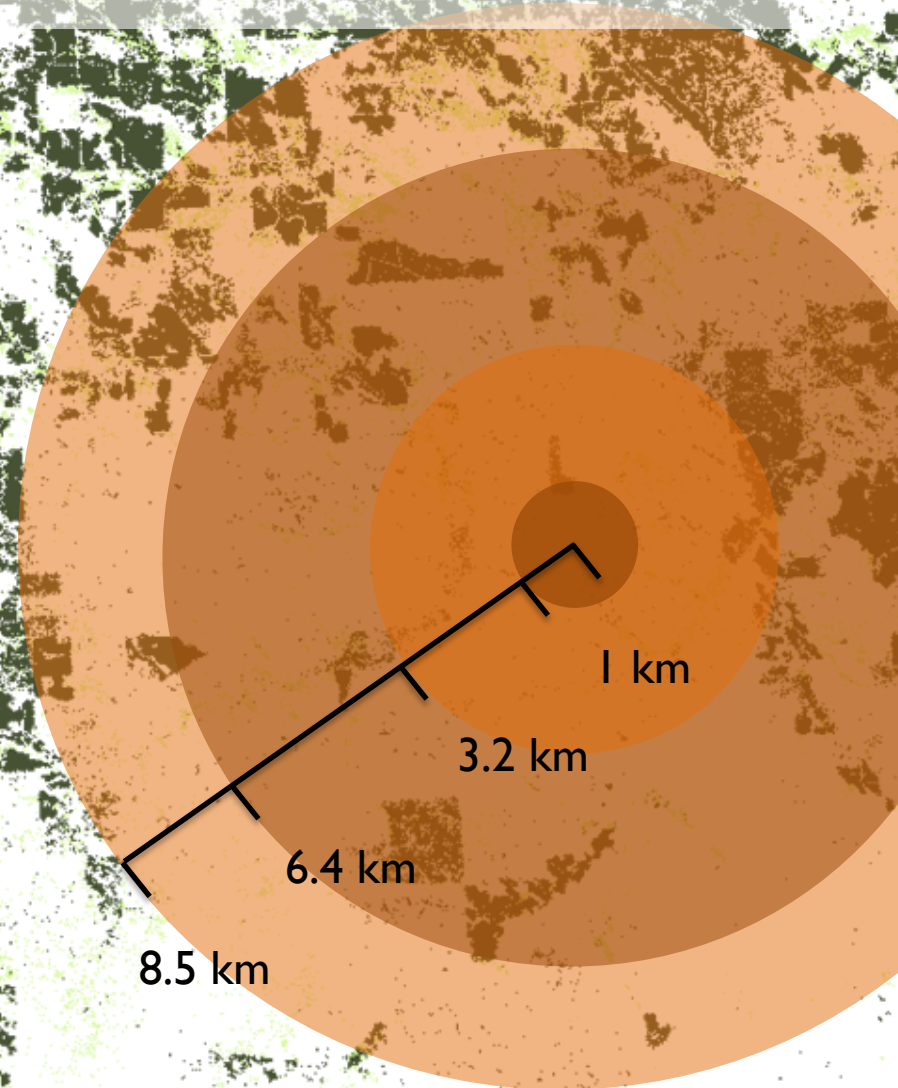
Impacts of cropland on sage-grouse



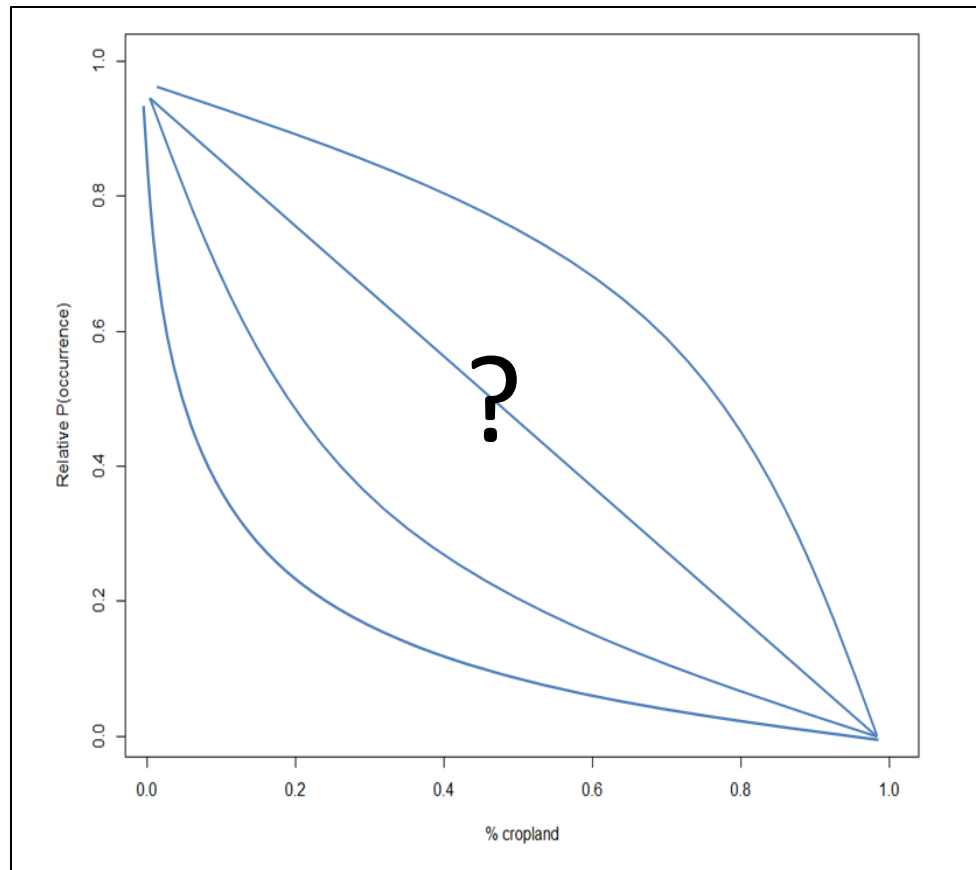
Impacts of cropland on sage-grouse

- Different spatial scales represent competing mechanistic hypotheses.

Connelly (2000), Holloran and Anderson (2005), Walker et al. (2007), Tack (2009),



Impacts of cropland on sage-grouse

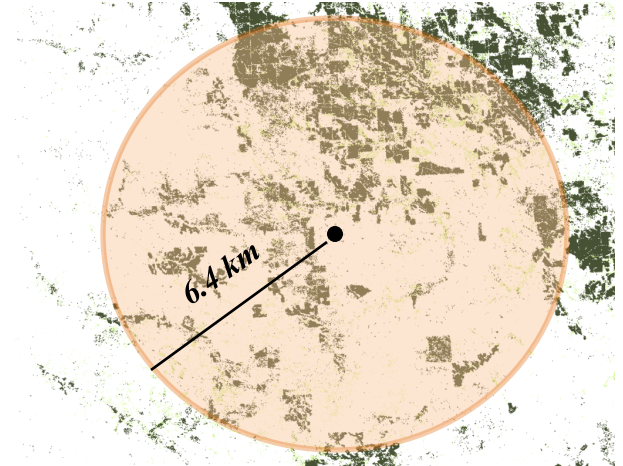


Impacts of cropland on sage-grouse

- Methods:
 - Compare landscape composition (proportion cropland) at known lek locations and random locations
 - Logistic regression

Impacts of cropland on sage-grouse

- Results:
 - 6.4 km scale was most supported
- 128.7 km² or 49.7 mi²*

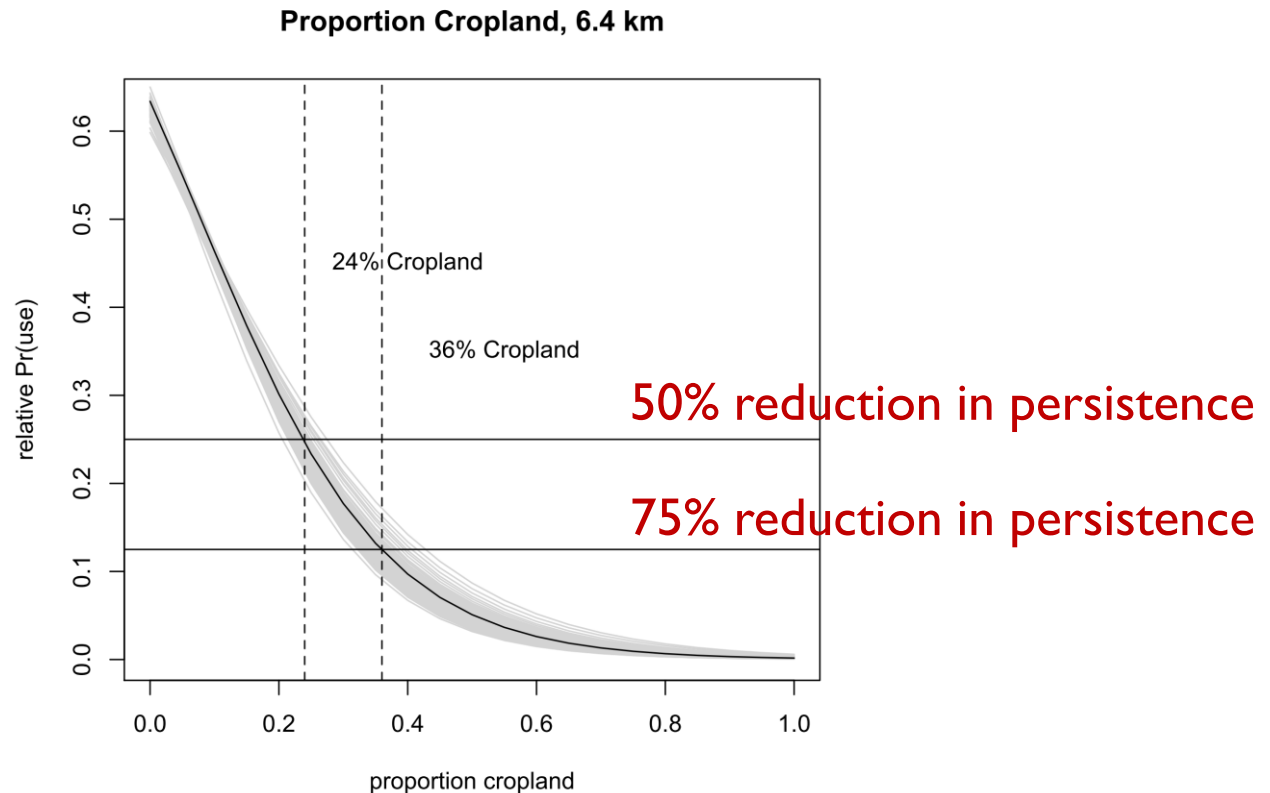


Model Name	log Likelihood	K	AIC	Δ AIC	w_i
6400	-1232.925	4	2473.849	0.00	0.542
3200	-1234.484	3	2474.967	1.12	0.310
6400_nh	-1234.749	4	2477.498	3.65	0.087
3200_nh	-1236.119	3	2478.237	4.39	0.060
800	-1259.776	2	2523.552	49.70	0.000
800_nh	-1262.424	2	2528.848	55.00	0.000

Impacts of cropland on sage-grouse

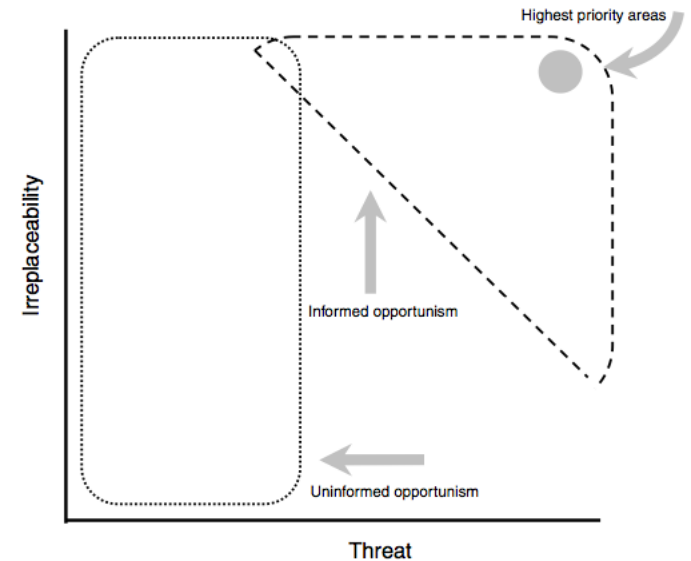
- **Results:**

- Steep decline in probability of lek occurrence with increasing % cropland



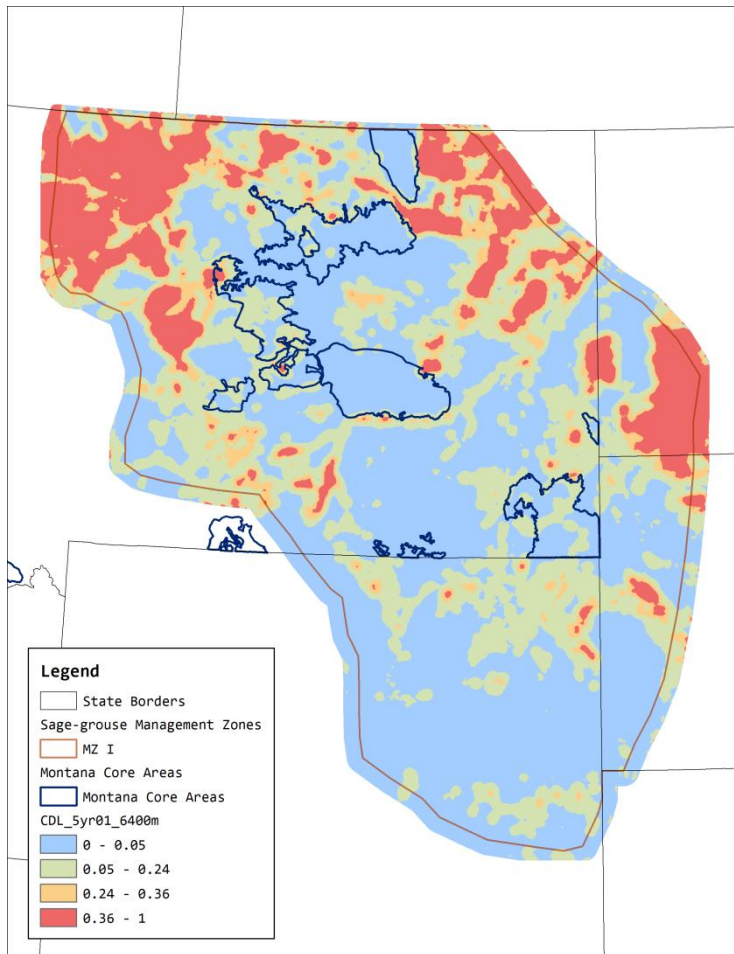
What can we do about it?

- **Prioritize**
 - Intact habitat (core areas)
 - Scale relevant to leks (6.4 km buffer?)
 - High risk of conversion



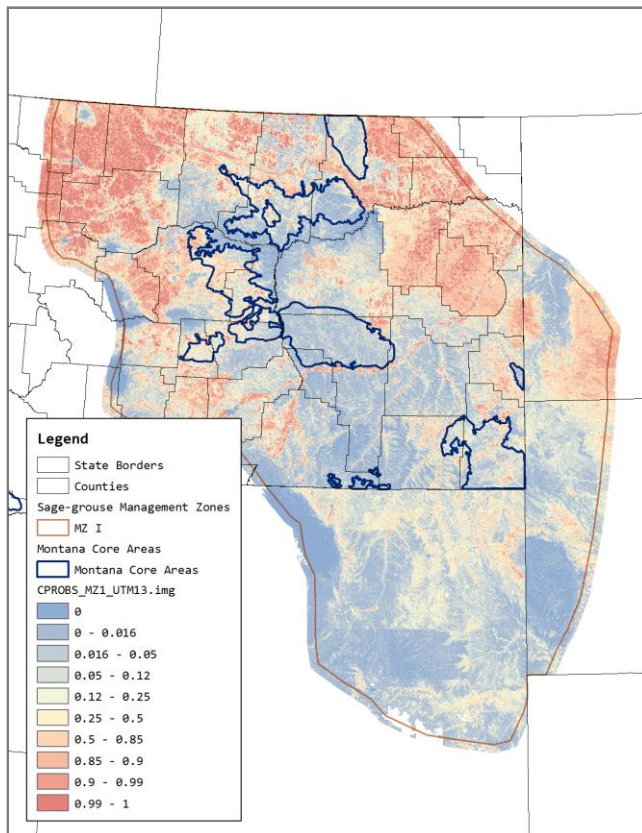
What can we do about it?

- Core Areas are intact

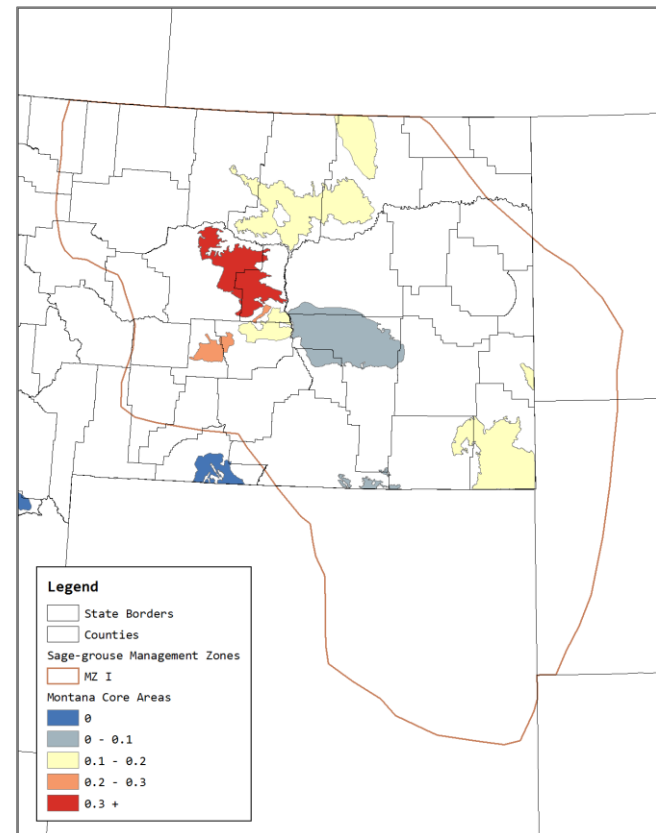


What can we do about it?

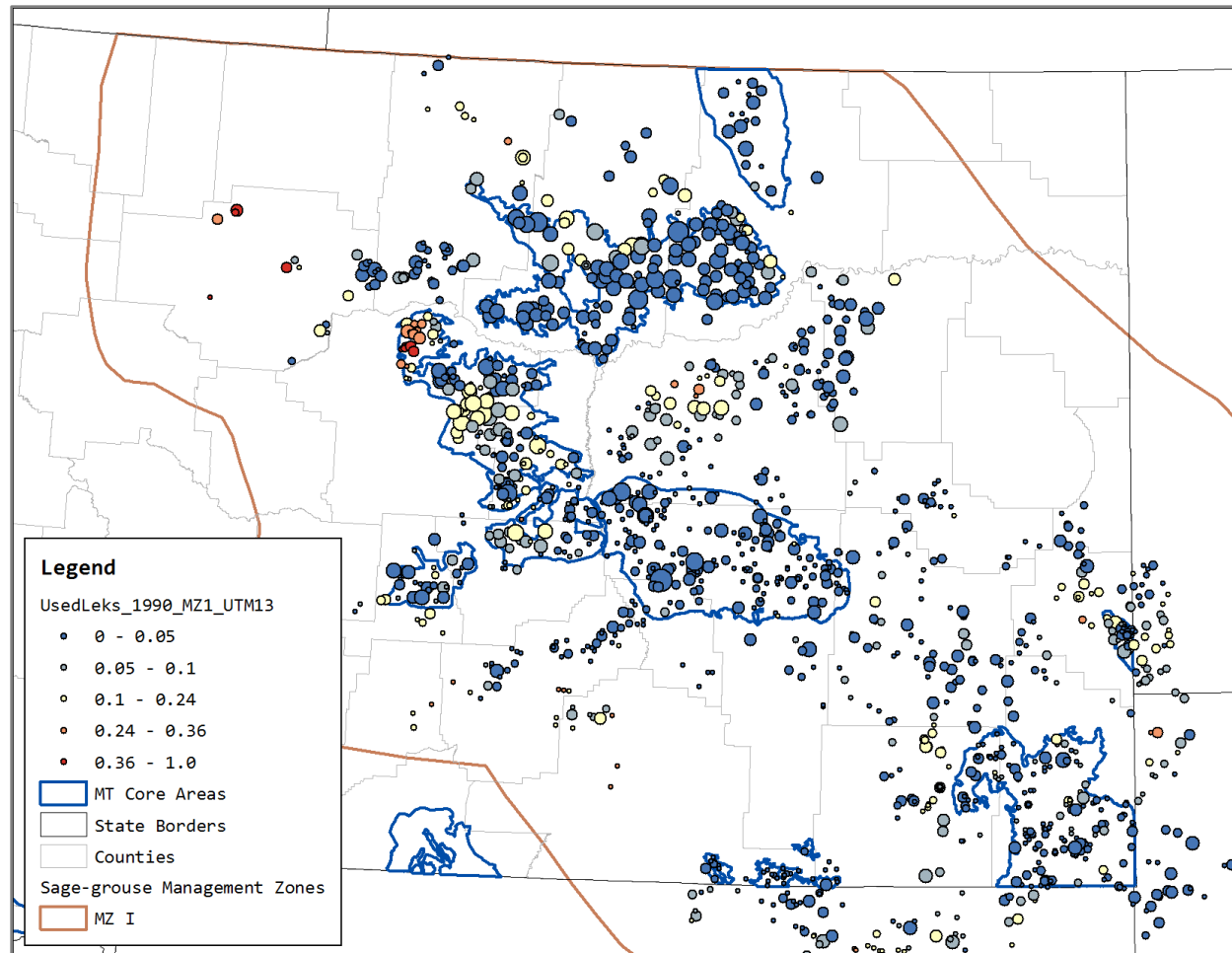
Crop suitability model



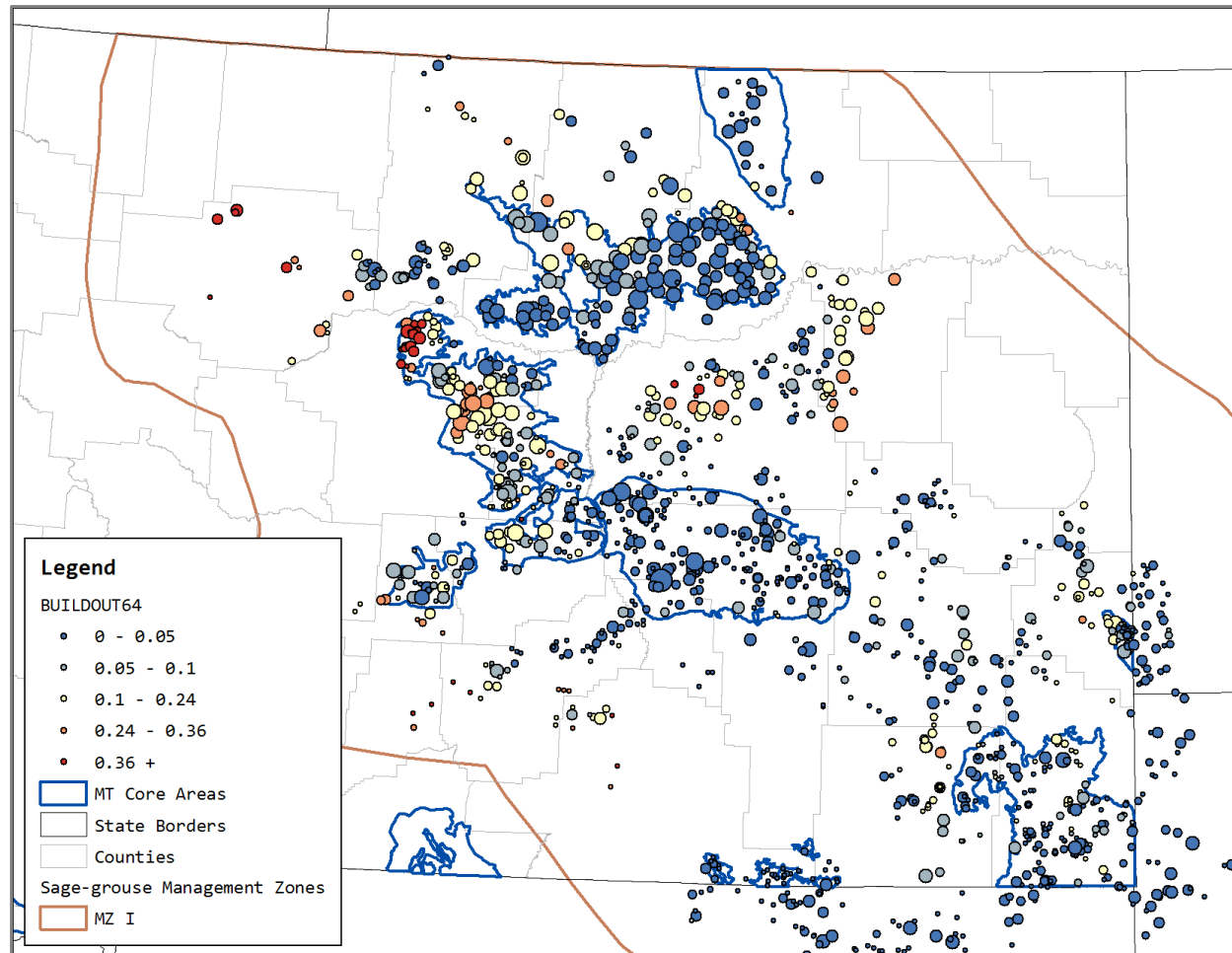
Conversion risk, by core area



What can we do about it?



What can we do about it?



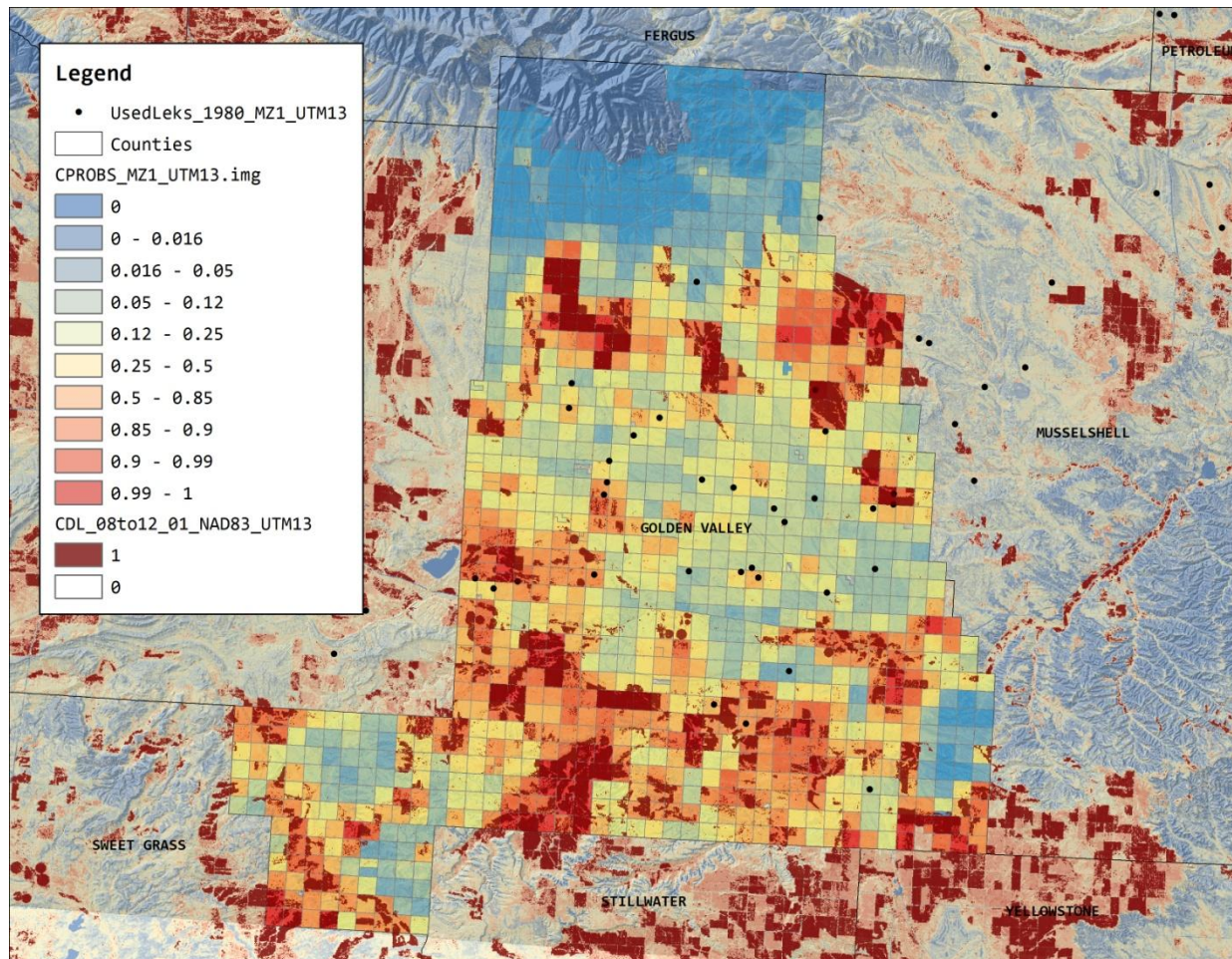
What can we do about it?

- Narrow it down...

Lek Description	2012	Build-out	At-risk
% cropland > 0.10	125	203	78
% cropland > 0.24	21	58	37
% cropland > 0.36	8	18	10
Core Area, % cropland > 0.10	58	101	43
Core Area, % cropland > 0.24	11	30	19
Core Area, % cropland > 0.36	5	12	7

Dataset included all Montana leks counted in the last 10 years that were active (≥ 1 male displaying) at last count ($n = 970$). Build-out and at-risk numbers are very preliminary, and are shown for illustrative purposes only.

What can we do about it?



Future work: Build-out scenarios

1. Derive crop suitability at parcel scale
2. Simulate cropping parcels with high suitability until desired increase in cropland is achieved.
3. Extract % cropland at leks and predict probability of persistence.
4. Target leks where probability of persistence falls below a threshold level with simulated cropland expansion.

What can we do about it?

- Build-out scenarios will identify at-risk leks
- Parcel-scale crop suitability predictions provide a management-ready tool for targeted conservation implementation (e.g., via SGI on at-risk private lands).

Concluding remarks